

Calc I

Test 1 Review

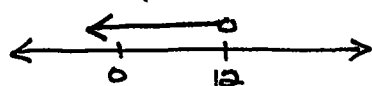
Answer Key

$$\textcircled{1} \quad 4(2x - 5) - 6x < 4$$

$$\begin{array}{r} 8x - 20 - 6x < 4 \\ +20 \qquad \qquad +20 \end{array}$$

$$\frac{2x}{2} < \frac{24}{2}$$

$$x < 12$$



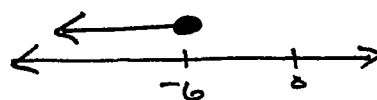
$$(-\infty, 12)$$

$$\textcircled{2} \quad -3(4x - 7) + 9x \geq 39$$

$$\begin{array}{r} -12x + 21 + 9x \geq 39 \\ -21 \qquad \qquad -21 \end{array}$$

$$\frac{-3x}{-3} \geq \frac{18}{-3}$$

$$x \leq -6 \quad \downarrow \text{Flip sign}$$



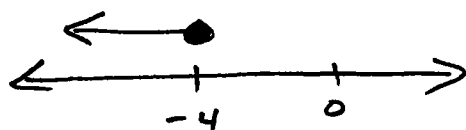
$$(-\infty, -6]$$

$$\textcircled{3} \quad \frac{-2x + 7}{-5} \leq -3 \quad (-5)$$

$$\begin{array}{r} -2x + 7 \geq 15 \\ -7 \qquad \qquad -7 \end{array} \quad \downarrow \text{Flip sign}$$

$$\begin{array}{r} -2x \geq 8 \\ -2 \qquad \qquad -2 \end{array} \quad \downarrow \text{Flip sign}$$

$$x \leq -4$$

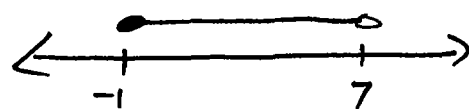


$$(-\infty, -4]$$

$$\textcircled{4} \quad \frac{-12}{+8} \leq \frac{4x - 8}{+8} < \frac{20}{+8}$$

$$\frac{-4}{4} \leq \frac{4x}{4} < \frac{28}{4}$$

$$-1 \leq x < 7$$



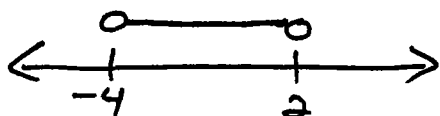
$$[-1, 7)$$

$$\textcircled{5} \quad \frac{7}{-11} < \frac{-2x+11}{-11} < \frac{19}{-11}$$

$$\frac{-4}{-2} < \frac{-2x}{-2} < \frac{8}{-2}$$

Flip
sign

$$2 > x > -4$$



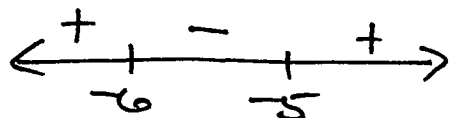
$$(-4, 2)$$

$$\textcircled{7} \quad \frac{5x^2+11x+30}{-4x^2} < \frac{4x^2}{-4x^2}$$

$$x^2+11x+30 < 0$$

$$(x+5)(x+6) = 0$$

$$x = -5, -6$$



looking for where
quadratic is less than zero

$$(-6, -5)$$

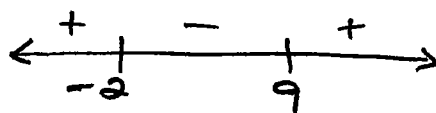
$$\textcircled{6} \quad \frac{x^2-7x}{-18} \geq \frac{18}{-18}$$

$$x^2-7x-18 \geq 0$$

crit vals:

$$(x-9)(x+2) = 0$$

$$x = 9 \quad x = -2$$



looking for where
quadratic is greater
than zero (positive)

$$(-\infty, -2] \cup [9, \infty)$$

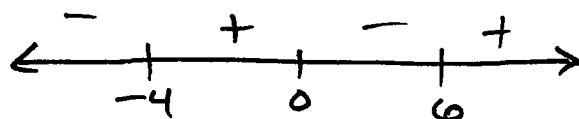
$$\textcircled{8} \quad \frac{x^3-5x^2-24x}{+3x^2} > \frac{-3x^2}{+3x}$$

$$x^3-2x^2-24x > 0$$

$$x(x^2-2x-24) > 0$$

$$x(x+4)(x-6) > 0$$

$$x = 0, -4, 6$$

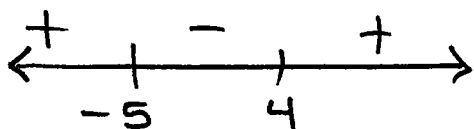


looking for cubic to be
greater than zero

$$(-4, 0) \cup (6, \infty)$$

$$\textcircled{9} \quad \frac{3x-12}{x+5} > 0$$

$$\text{crit val: } \begin{array}{l|l} 3x-12=0 & x+5=0 \\ x=4 & x=-5 \end{array}$$



$$(-\infty, -5) \cup (4, \infty)$$

$$\textcircled{10} \quad \frac{20}{3x} \leq 2$$

$$\frac{20}{3x} - \frac{2}{1} \leq 0$$

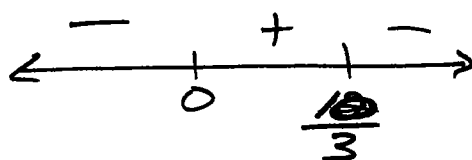
$$\frac{20-6x}{3x} \leq 0$$

$$\text{crit val: } 20-6x=0$$

$$\textcircled{1} \quad \boxed{x = \frac{10}{3}}$$

$$\textcircled{2} \quad 3x=0$$

$$\boxed{x=0}$$



$$(-\infty, 0) \cup \left[\frac{10}{3}, \infty\right)$$

↑ open b/c at zero the function is undefined

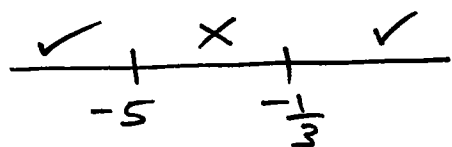
$$\textcircled{11} \quad |3x+8| \geq 7$$

crit val:

$$3x+8=7 \quad | \quad 3x+8=-7$$

$$3x=-1 \quad | \quad 3x=-15$$

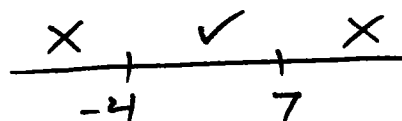
$$x=-\frac{1}{3} \quad | \quad x=-5$$



$$(-\infty, -5] \cup \left[-\frac{1}{3}, \infty\right)$$

$$\textcircled{12} \quad |2x-3| < 11$$

$$\text{crit val: } \begin{array}{l|l} 2x-3=11 & 2x-3=-11 \\ 2x=14 & 2x=-8 \\ x=7 & x=-4 \end{array}$$



$$(-4, 7)$$

$$(13) \quad \left| \frac{4}{x} + 5 \right| > 2$$

crit val:

$$\frac{4}{x} + 5 = 2$$

$$\frac{4}{x} = -3$$

$$4 = -3x$$

$$x = -\frac{4}{3}$$

$$\frac{4}{x} + 5 = -2$$

$$\frac{4}{x} = -7$$

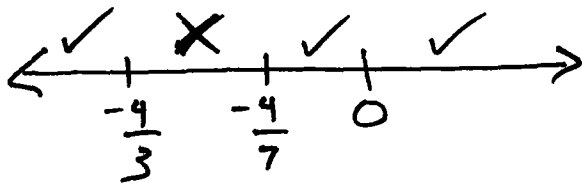
$$4 = -7x$$

$$x = -\frac{4}{7}$$

$$x = 0$$

crit value b/c it makes original expression undefined

$$(-\infty, -\frac{4}{3}) \cup (-\frac{4}{7}, 0) \cup (0, \infty)$$



$$(14) \quad \left| 3 - \frac{7}{x} \right| < 1$$

crit val:

$$3 - \frac{7}{x} = 1$$

$$-\frac{7}{x} = -2$$

$$-7 = -2x$$

$$x = \frac{7}{2}$$

$$3 - \frac{7}{x} = -1$$

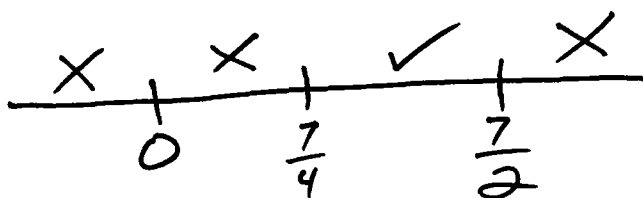
$$-\frac{7}{x} = -4$$

$$-7 = -4x$$

$$x = \frac{7}{4}$$

$$x = 0$$

$$\left(\frac{7}{4}, \frac{7}{2} \right)$$



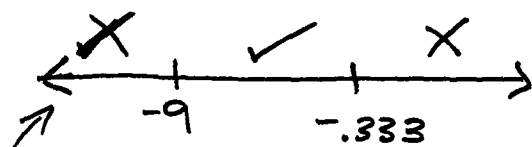
$$(15) |2x+5| \leq |x-4|$$

crit val: $x = -9, -0.333$ ← Graphed both sides:

$$y_1 = \text{abs}(2x+5)$$

$$y_2 = \text{abs}(x-4)$$

then found intersections

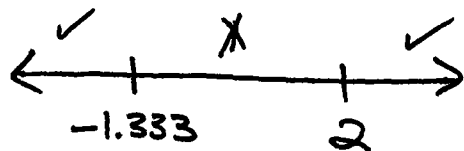


looking for where y_1 is lower than y_2 .

$$\underline{\text{ans: } [-9, -0.333]}$$

$$(16) |2x+1| > |x+3|$$

crit val: $x = -1.333, 2$



$$\underline{\text{ans: } (-\infty, -1.333) \cup (2, \infty)}$$

$$(17) (4, 7) (2, 5)$$

$$m = \frac{7-5}{4-2} = \frac{2}{2} = 1$$

Point-Slope: $(y-7) = 1(x-4)$

y-intercept: $y-7 = 1x-4$

$$\boxed{y = x + 3}$$

standard: $y = x + 3$

$$\boxed{-x + y = 3}$$

⑮ (4, 3) (-12, -1)

Point-Slope: $(y-3) = \frac{1}{4}(x-4)$

$m = \frac{3+1}{4+12} = \frac{4}{16} = \frac{1}{4}$ slope int: $y-3 = \frac{1}{4}(x-4)$

standard: $4(y = \frac{1}{4}x + 2)$

$$\begin{array}{r} 4y = x + 8 \\ -x \quad -x \\ \hline \end{array}$$

$-x + 4y = 8$

$$\begin{array}{r} y-3 = \frac{1}{4}x - 1 \\ +3 \quad +3 \\ \hline \end{array}$$

$y = \frac{1}{4}x + 2$

⑯ $3x - 4y = 8$

Point-Slope: $(y+7) = \frac{3}{4}(x-12)$

$$\begin{array}{r} -4y = -3x + 8 \\ -4 \quad -4 \\ \hline \end{array}$$

$y = \frac{3}{4}x - 2$

$m = \frac{3}{4}$

slope-int:

$y+7 = \frac{3}{4}(x-12)$

$$\begin{array}{r} y+7 = \frac{3}{4}x - 9 \\ -7 \quad -7 \\ \hline \end{array}$$

$y = \frac{3}{4}x - 16$

Standard: $4(y = \frac{3}{4}x - 16)$

$$\begin{array}{r} 4y = 3x - 64 \\ -3x \quad -3x \\ \hline \end{array}$$

$-3x + 4y = -64$

$$\textcircled{20} \quad \begin{array}{r} 4x + 10y = 64 \\ -4x \qquad -4x \\ \hline 10y = -4x + 64 \\ \hline 10 \end{array}$$

$$y = -\frac{2}{5}x + 6.4$$

$$m = -\frac{2}{5}$$

$$\text{Point-slope: } (y-2) = -\frac{2}{5}(x-10)$$

$$\text{Slope-int: } y-2 = -\frac{2}{5}(x-10)$$

$$\begin{array}{r} y-2 = -\frac{2}{5}x + 4 \\ +2 \qquad +2 \end{array}$$

$$y = -\frac{2}{5}x + 6$$

$$\text{Standard: } 5(y = -\frac{2}{5}x + 6)$$

$$\begin{array}{r} 5y = -2x + 30 \\ +2x \qquad +2x \end{array}$$

$$2x + 5y = 30$$

$$\textcircled{21} \quad \begin{array}{r} -2x - 8y = 32 \\ +2x \qquad +2x \\ \hline \end{array}$$

$$\begin{array}{r} -8y = 2x + 32 \\ \hline -8 \end{array}$$

$$y = -\frac{1}{4}x - 4$$

$$m = -\frac{1}{4}$$

$$\perp m = 4$$

$$\text{Point-slope: } (y-1) = 4(x+5)$$

$$\text{Slope-int: } (y-1) = 4(x+5)$$

$$\begin{array}{r} y-1 = 4x + 20 \\ +1 \qquad +1 \end{array}$$

$$y = 4x + 21$$

$$\text{Standard: } \begin{array}{r} y = 4x + 21 \\ -4x \qquad -4x \\ \hline \end{array}$$

$$-4x + y = 21$$

$$\textcircled{22} \quad \begin{array}{r} 9x + 6y = 12 \\ -9x \quad -9x \end{array}$$

$$\frac{6y}{6} = \frac{-9x + 12}{6}$$

$$y = -\frac{3}{2}x + 2$$

$$m = -\frac{3}{2}$$

$$\boxed{\perp m = \frac{2}{3}}$$

$$\text{Point-Slope: } \boxed{(y+1) = \frac{2}{3}(x-9)}$$

$$\text{Slope-Int: } y+1 = \frac{2}{3}(x-9)$$

$$\begin{array}{r} y+1 = \frac{2}{3}x - 6 \\ -1 \quad -1 \end{array}$$

$$\boxed{y = \frac{2}{3}x - 7}$$

$$\text{Standard: } 3(y = \frac{2}{3}x - 7)$$

$$\begin{array}{r} 3y = 2x - 21 \\ -2x \quad -2x \end{array}$$

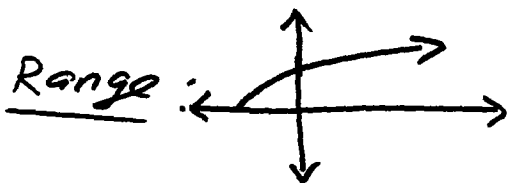
$$\boxed{-2x + 3y = -21}$$

$$\textcircled{23} \quad y = \sqrt{x+2}$$

$$D: x+2 \geq 0$$

$$x \geq -2$$

$$\boxed{D: [-2, \infty)}$$



$$\boxed{R: [0, \infty)}$$

IS a function

~~23~~
23
(again)

$$D: \{1, 3, 5, 7\}$$

$$R: \{2, 4, 6, 8, 10\}$$

not a function.

when $x=3$, there are 2 y-values.

$$\textcircled{24} \quad f(6) = \frac{6}{3} + 6^2 \quad f(-3) = \frac{-3}{3} + (-3)^2$$

$$2 + 36 \quad -1 + 9$$

$$\boxed{38} \quad \boxed{8}$$

$$f(0) = \frac{0}{3} + 0^2$$

$$0 + 0$$

$$\boxed{0}$$

$$f(1) = \frac{1}{3} + 1^2$$

$$\frac{1}{3} + 1$$

$$\boxed{\frac{4}{3}}$$

$$\textcircled{25} \quad \frac{-9}{(x-1)+2} = \boxed{\frac{-9}{x+1}}$$

$$\textcircled{26} \quad (x-1)^2 + 5$$

$$(x^2 - 2x + 1) + 5$$

$$\boxed{x^2 - 2x + 6}$$

$$\textcircled{27} \quad (x^2 + 5) - 1$$

$$\boxed{x^2 + 4}$$

$$\textcircled{28} \quad \frac{-9}{(x^2+5)+2} = \boxed{\frac{-9}{x^2+7}}$$

29

$$\frac{-9}{x+2} - 1$$

$$\frac{-9}{x+2} - \frac{(x+2)}{x+2} = \boxed{\frac{-x-11}{x+2}}$$

30

$$(3-1)^2 + 5 = 4 + 9 = \boxed{13}$$

31-33 (see graph)

$$(34) y = \frac{x+3}{x^2-5x-14} = \frac{x+3}{(x-7)(x+2)}$$

$$\underline{VA}: (x-7)(x+2) = 0$$

$$\boxed{x=7 \text{ and } x=-2}$$

$$\underline{HA}: \boxed{y=0} \text{ (Power of greater in denominator)}$$

$$(35) y = \frac{2x(x+3)(x-5)}{x(x+3)(x+4)} = \frac{2(x-5)}{x+4}$$

$$\underline{VA}: x+4=0$$

$$\boxed{x=-4}$$

$$\underline{HA}: \boxed{y=2} \text{ (L.C.R.)}$$

$$\underline{Hole}: \boxed{x=0} \mid x+3=0$$

$$\boxed{x=-3}$$

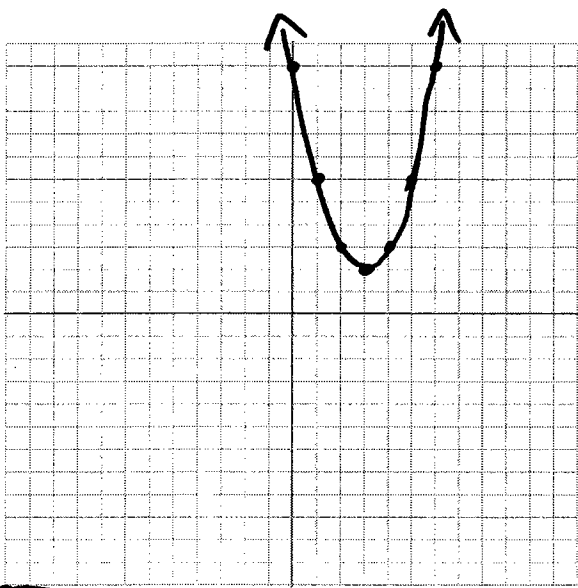
$$(36) y = \frac{x^2+4x+12}{x-2}$$

$$\underline{VA}: x-2=0$$

$$\boxed{x=2}$$

$$\underline{SA}: \begin{array}{r|rrrr} 2 & 1 & 4 & 12 & \\ & & 2 & 12 & \\ \hline & 1 & 6 & 24 & \end{array}$$

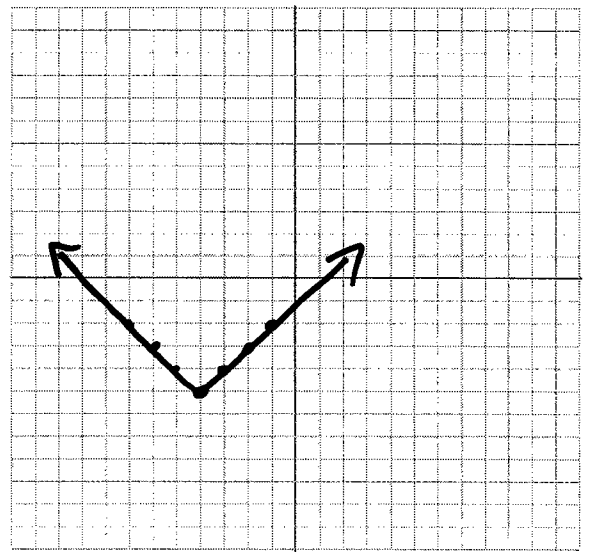
$$\boxed{y = x + 6}$$



③① Right 3

up 2

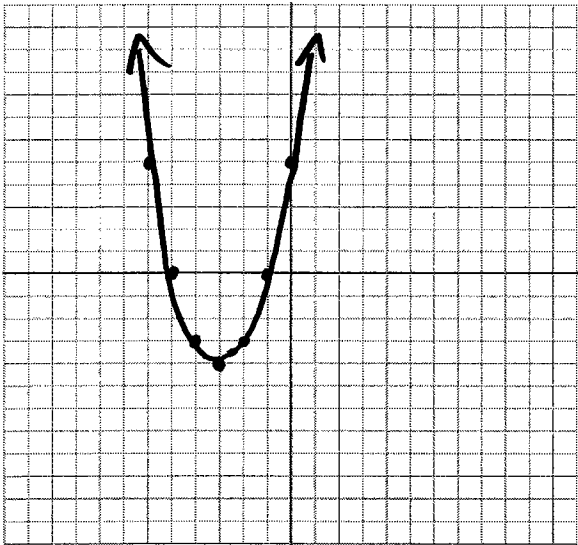
$\frac{1}{1} \quad \frac{3}{1} \quad \frac{5}{1} \dots$



③② Left 4

Down 5

$\frac{1}{1} \quad \frac{1}{1} \quad \frac{1}{1}$



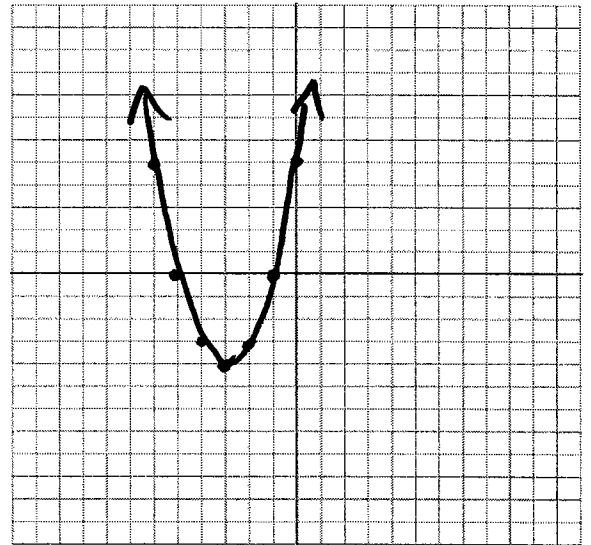
$$\textcircled{33} \quad y = x^2 + 6x + 5$$

$$y = x^2 + 6x + 9 - 4$$

$$y = (x + 3)^2 - 4$$

Left 3, down 4

$\frac{1}{1} \quad \frac{3}{1} \quad \frac{5}{1} \dots$



③③ using formula:

$$y = x^2 + 6x + 5$$

$$x = \frac{-b}{2a} = \frac{-6}{2(1)} = \frac{-6}{2} = -3$$

$$y = (-3)^2 + 6(-3) + 5 = -4$$

Vertex: $(-3, -4)$

$\frac{1}{1} \quad \frac{3}{1} \quad \frac{5}{1} \dots$